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1.0 INTRODUCTION

This document is meant as an aide in the development of user software to interface with the GPD 350-6A Digital Signal Analyzer and the GPD 351A 6 MHz Translator. The GPD 351A provides the following interface capabilities to the controller.

- * Read and Control designated GPD 350-6A front panel switches.
- * Read and Control GPD 351A functions.
- * Read real time and averaged spectrum data in both 12- and 8-bit formats.
- * Write data to the GPD 350-6A's Auxiliary Memory.
- * Read processing status information.

2.0 TECHNICAL REFERENCES

IEEE Standard Digital Interface for Programmable Instrumentation

IEEE Standard 488-1978

3.0 IEEE INTERFACE CAPABILITY

3.1 Bus Interface Subsets

SH1 - Complete source handshake capability
AH1 - Complete acceptor handshake capability
T2 - Talker
L2 - Listener
SR1 - Complete service request capability
RL2 - Remote/Local capability with no local lockout
PPO - No parallel poll capability
DC1 - Complete device clear capability
DT0 - No device trigger capability

3.2 Messages

- a. TALK/LISTEN ADDRESSES - The Talk/Listen interface function provides a device with the capability to send/receive device dependent data over the interface to other devices. The talk/listen address is a unique numeric identifier for each of the devices on the interface.

- b. DATA MESSAGE - The Data Message is the actual information that is sent from a talker to one or more listeners. This action requires the controller to first enter the command mode to set up the talker and listener(s) for the transfer of data. The information is then transferred in the data mode.
- c. CLEAR - There are three methods in which a controller may clear a device on the bus: interface clear (IFC), which returns all devices on the bus to talker idle state, selective device clear (SDC) which clears any device on the bus that is in the listener active state, and device clear (DCL) which clears all devices on the bus, regardless of their individual operating state. Both SDC and DCL are device defined in terms of capability and functionality. The GPD 351A performs a power-on reset for SDC and DCL.
- d. REMOTE - The remote mode is a device operating mode whereby the controller determines dedicated device control parameters. If implemented, the controller can place a device into remote control by raising the REN line and then addressing the device as a listener. See Section 4.1.4 for the remote operating control of the GPD 351A.
- e. LOCAL - A device is under local control when the device itself is in charge of its operating parameters. Typically, this means front panel control. There are three ways a device may return to local from remote control: lowering of the REN line by the controller, issuance of a go to local (GTL) command by the controller when the device has been addressed as a listener, and by the device itself if implemented. See Section 4.1.4 for the remote/local features of the GPD 351A.
- f. SERVICE REQUEST - The service request is a hardwired bus line which is set by a device to flag the controller that the device needs service. In response to a service request, the controller performs a serial poll of each device to determine which device requested service and what the device's need is. See Section 6.0 for the service request conditions of the GPD 351A.

- g. SERIAL POLL - The serial poll is a means by which the controller may determine the operational status of any device on the bus. To perform a serial poll the controller sends the serial poll enable command (SPE), addresses the selected device as talker and reads the status byte. See Section 6.0 for an explanation of the GPD 351A serial poll status byte.

3.3 Universal Command Group

A Universal Command is a command issued by the controller which causes all the devices with this capability to respond. The three universal commands supported by GPD 351A DEVICE CLEAR, SERIAL POLL ENABLE, and SERIAL POLL DISABLE.

DEVICE CLEAR

All the devices on the bus which have the DEVICE CLEAR capability will clear themselves. The controller can also send SELECTIVE DEVICE CLEAR to clear the GPD 351A without effecting other devices on the interface.

SERIAL POLL ENABLE

All devices on the interface bus which have the Service Request capability will be ready to send their status byte to the controller when they are in talker addressed state. The controller needs to send a talker address to put the GPD 351A into the talker addressed state.

SERIAL POLL DISABLE

All devices on the interface bus which have the Service Request capability will return to the Serial poll idle state.

4.0 OPERATIONS

4.1 GPIB Functional Summary

The GPIB interface contained within the GPD 351A functions as an interface to both the GPD 351A and the GPD 350-6A. The following sections briefly summarize the operation of both devices in terms of their GPIB accessibility. The first two sections discuss each device individually on a switch by switch basis. The third section clarifies averager operation and the fourth describes processing control.

4.1.1 GPD 350-6A Front Panel

For purposes of conciseness, "READ" means read only over the bus; "WRITE" means both read and write over the bus, with values writable only while the switch is set to the EXT position, and "WRITE*" means both read and write over the bus regardless of the current switch setting. See Figure 4.1.

NOTE:

- Switches that are "WRITE" accessible default to a defined setting when set to the EXT position. Until some value other than the EXT setting is written to such a switch, the switch will read EXT and the GPD350-6A will continue processing using the default setting.
- Once a setting has been written to a "WRITE" accessible switch in the EXT position, the switch will appear to be at that setting when read, not in the EXT or writable position. It is therefore suggested that any such switch be written to and then be immediately read back to verify each write.

INPUT SIGNAL LEVEL METER

N/A

Indicates the relative amplitude of the input signal. Red zones at the ends of the meter scale indicate a "too high" or "too low" input signal.

RANGE (dB/1Vrms)

READ

Selects INPUT ATTN (-40 dB to -10 dB) or INPUT GAIN (0 to 40 dB). This gain or attenuation is applied to the input signal in order to normalize the amplitude of the signal to the anti-aliasing filter.

POST-FILTER GAIN (dB)

READ

Selects additional gain to be applied to the signal following the anti-aliasing filter. Range is 0 dB to 30 dB in 10 dB steps.

AC/DC/TEST

N/A

Selects either AC or DC coupling for the input signal or connects the internal test signal to the input.

HOLD

READ

Operates load control to prevent the update of input memory. Illuminated when in HOLD.

INPUT Connector

N/A

Accepts the analog data input signal for analysis.

RESOLUTION Hz

N/A

Provides a 6-digit LED readout of the bin resolution in Hz. Resolution is equal to the bandwidth divided by the total number of bins (the Transform Size divided by 2.56). Reads 0 when in external sampling mode.

WEIGHTING OUT Indicator

N/A

Lights to indicate that the weighting function has been defeated.

TRANSFORM SIZE Selector

WRITE

Determines the number of data bins to be displayed on the CRT or plotted on an X-Y plotter by selecting the number of transform points to be processed. The number of data bins to be displayed is equal to the selected TRANSFORM SIZE divided by 2.56. EXT Default: 2048.

<u>TRANSFORM SIZE</u>	<u>NO. OF BINS</u>	<u>DISPLAYED</u>
2048	800	
1024	400	
512	200	
256	100	
128	50	
64	25	

RANGE (Hz)

WRITE

Selects the analysis frequency range in decade increments of 1, 2, and 5 from 10 Hz to 300 kHz. EXT Default: 10,000 Hz.

EXPAND Mode Selector

WRITE

ON: Translate to the center frequency determined by the % RANGE switch with the bandwidth determined by the MAGNIFY switch.

OFF/EXT: Normal baseband operation.

INTEN: Increases the CRT intensity of the fraction of the bandwidth determined from the MAGNIFY switch about the center frequency determined from the % RANGE switch.

% RANGE

WRITE

Determines the center frequency of the intensified or translated portion of the spectrum (determined by the EXPAND switch) by selecting a percentage of the RANGE (Hz) switch setting. For example, if the RANGE selector is on 100 KHz and the % RANGE selector is placed at 30.0, the center frequency of the intensified or expanded area will be 30.0 KHz. EXT Default: 00.0 = 100%.

MAGNIFY

WRITE

Determines the bandwidth of the intensify and translate modes of the EXPAND switch as a fraction of the RANGE Hz switch setting. Steps range from x2 (1/2 of the RANGE Hz setting) to x128 (1/128 of the RANGE Hz setting). EXT Default: X1.

POWER Pushbutton/Indicator

N/A

Applies primary power to and removes primary power from the power supply.

DISPLAY GAIN LOG/LIN Selector

N/A

Selects either logarithmic or linear scaling the for CRT display card and the cursor amplitude display. When in LOG, the output is in dB/1Vrms, when in LIN, the output is in mV.

PRESS FOR SPECTRUM LEVEL

N/A

Push to display the amplitude of the cursor bin in volts/square root Hz normalized to 1 Hz. The calculation is not performed in the external sampling mode or with weighting defeated.

Cursor FREQ (Hz) Display

N/A

Provides an eight-digit LED readout of the frequency at the cursor location. This readout is equal to the bin number times the RESOLUTION.

DISPLAY GAIN Selector

N/A

Selects the linear data gain in binary steps from 1 to 128. Operational only when the LOG/LIN selector is in the LIN position.

CURSOR Selector

N/A

Selects the trace (UPPER or LOWER) on which the cursor will be active when DUAL DISPLAY SEPARATION is selected.

CURSOR Control

READ

Controls the position of the cursor on the selected trace. Turn clockwise to move the cursor to the right; turn counterclockwise to move the cursor to the left. The bin index of the current cursor position is available over the bus.

SOURCE Selector

WRITE

REAL TIME - Selects real time spectra for AUX MEMORY input.

EXT - Allows external loading of AUX MEMORY when the TRANSFER selector is also set to EXT.

AVGR - Selects averaged spectra for AUX MEMORY input.

TRANSFER Selector

WRITE

AUTO LOAD	Provides for continuous loading of new data from the selected source.
HOLD/EXT	Holds the current AUX MEMORY contents, allows external loading of AUX MEMORY when the SOURCE selector is also set to EXT.
LOAD	Updates the auxiliary memory with one complete spectrum, then holds the new data.

LOWER/UPPER Trace Source Selector

N/A

AVGR/AUX	Selects data from the averager memory for display on the LOWER trace and selects data from the auxiliary memory for display on the UPPER trace. Selects AUX MEMORY as the Sweep 1 spectrum data read source.
----------	--

REAL TIME/AVGR	Selects real time data for display on the LOWER trace and selects data from the averager memory for display on the UPPER trace. Selects Real Time as the Sweep 1 spectrum data read source.
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SEPARATION Control

N/A

Enables DUAL display when pulled out, blanks the upper trace when pushed in. Rotation of the knob in DUAL DISPLAY mode adjusts the vertical position of the upper trace on the CRT.

START Pushbutton/Indicator

WRITE*

Starts the averager from a stopped or reset state. The indicator is illuminated when the averager is running. See Section 4.1.3.

STOP Pushbutton/Indicator

WRITE*

Stops the selected averaging process and illuminates the STOP indicator. In LIN averaging mode, the STOP indicator will be illuminated when averaging is completed. See section 4.1.3.

RESET Pushbutton/Indicator

WRITE*

Stops the selected averaging process, clears the averager memory, and illuminates both the STOP and RESET indicators. See Section 4.1.3.

AVERAGER MODE Selector

WRITE

LIN Linear averaging.

EXPO/EXT Exponential averaging.

PEAK Peak averaging.

NUMBER OF AVERAGES Selector

WRITE

Selects the number of ensembles to be averaged in binary steps from 1 to 512. See Section 4.1.3. EXT Default: None.

SWEEP/HOLD Pushbutton/Indicator for Plotting

N/A

Starts and stops the plotter trace. Push once to start the trace and push again to stop the trace. When SWEEP is selected, the indicator is illuminated and the cursor is moved across the CRT display from left to right by the plotter sweep circuits. The plotter output follows the cursor. The cursor sweeps the UPPER or LOWER display trace selected by the CURSOR SELECTOR.

RESET Pushbutton/Indicator for Plotting

N/A

Resets the cursor to the left edge of the X-Y display, resets the plotter to the beginning of the trace, and illuminates the RESET indicator while the pushbutton is depressed.

SPEC CAL/OP/FREQ CAL Selector

N/A

SPEC CAL Provides either 20 dB or 40 dB attenuation of the displayed data for calibrating the Y-axis (spectrum level) of the CRT and X-Y plotter.

OP Places the instrument in the normal operating mode.

FREQ CAL Defeats normal cursor operation and provides either a ZERO or full scale (FS) X-axis (frequency) voltage level for calibrating the X-axis of the X-Y plotter.

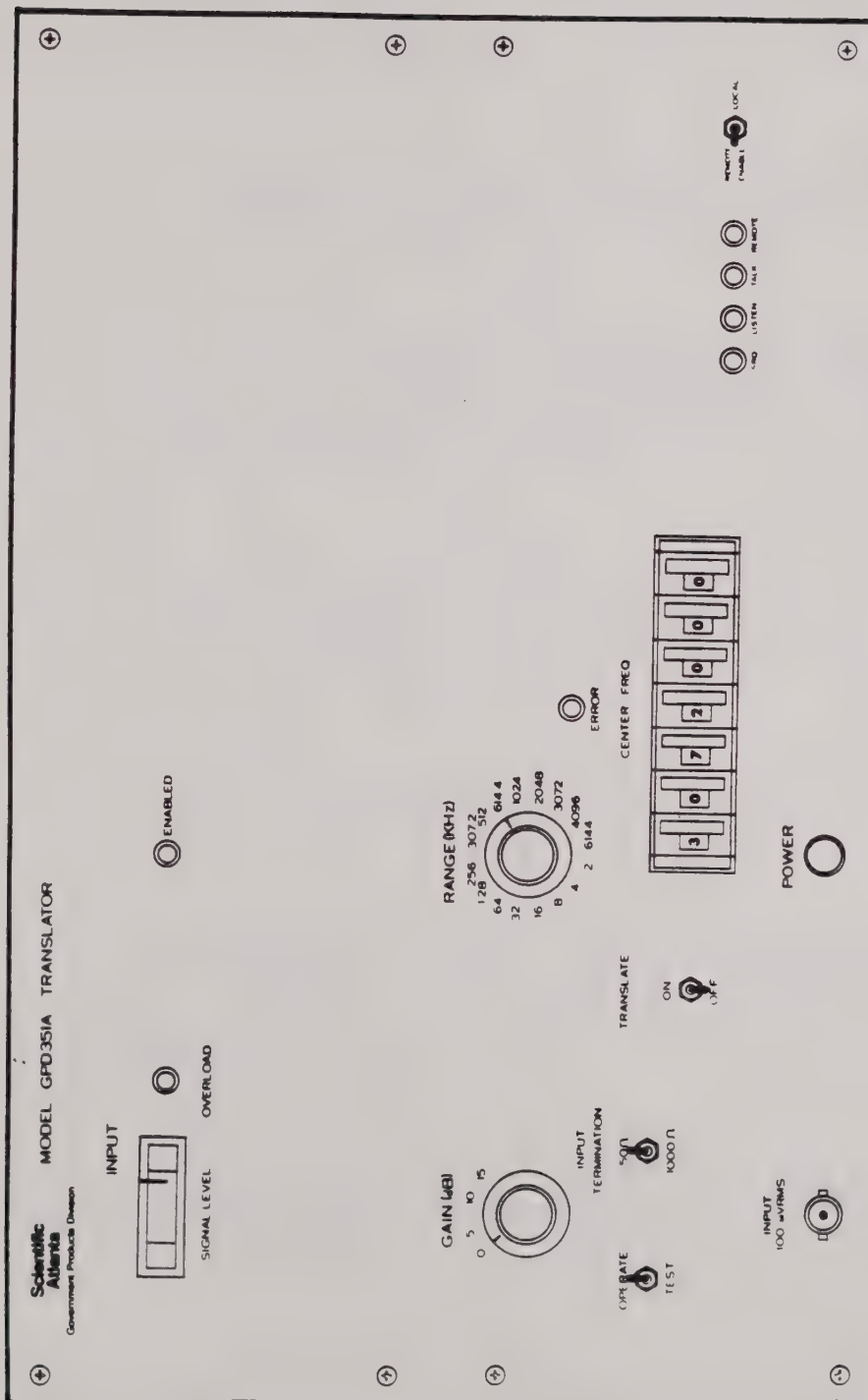


FIGURE 4-2 QPD 351A FRONT PANEL

4.1.2 GPD 351A Front Panel

The following is a summary of the GPD 351A front panel. See Figure 4-2. GPIB access of the GPD 351A differs from that of the GPD 350-6A in that the GPD 351A can be placed into a remote operating mode by the controller. See Section 4.1.4 for a complete discussion of this feature.

RANGE

Selects the processing bandwidth in steps from 2 KHz to 6.144 MHz. Switch position is read only over the bus. Processing ranges are extended when remotely controlled.

TRANSLATE

Enables translation to the center frequency selected by the CF selector with a bandwidth selected by the RANGE switch. When disabled, processing is in baseband mode with a bandwidth from 0 Hz up to the RANGE switch selection. Remotely controllable over the bus.

CF

Selects the center frequency when TRANSLATE is enabled. Defaults to (Bandwidth/2) when the selection is less than (Bandwidth/2), and [6.144 MHz - (Bandwidth/2)] when the selection is greater than [6.144 MHz - (Bandwidth/2)]. Remotely controllable over the bus.

REMOTE ENABLE/LOCAL

Momentary toggle switch which returns control from remote to local. See Section 4.1.4.

OVL D LED

Illuminates when the GPD 351A is in control and the GPD 351A input signal exceeds the level at which the A/D converters can operate properly. The overload condition can be detected over the bus by enabling the serial poll mask bit for overload. See section 6.0.

GPD 350-6A Remote ENABLE LED

Illuminates when the GPD 350-6A processing range switches: RANGE (Hz), EXPAND Mode & RANGE, and MAGNIFY are all in the EXT position, enabling GPD 351 control. Accessible by a serial poll. See Sections 4.1.4 and 6.0.

INVALID CF LED

Illuminates for invalid center frequency selection when in GPD 351A translate mode. An invalid center frequency is one either below $(\text{Bandwidth}/2)$ or above $[6.144 \text{ MHz} - (\text{Bandwidth}/2)]$. Accessible by a serial poll. See Section 6.0.

REMOTE LED

Illuminates when the GPD 350-6A GPD-351A system is under GPD 351A REMOTE control. See Section 4.1.4.

SRQ LED

Illuminates when a service request has been generated by the GPD 351A. See Section 6.0.

LISTEN LED

Illuminates when the GPD 351A is in GPIB listen active state. Not accessible over the bus.

TALK LED

Illuminates when the GPD 351A is in talker active state. Not accessible over the bus.

4.1.3 Averager Operation

The function of the Averager is to increase the detectability of weak signals by cancelling random noise and, thus, increasing the signal to noise ratio. This is done by point by point averaging real time spectra to yield an average over time. There are three methods, or modes, of averaging available: Peak, Linear, and Exponential. In each, the number of averaged real time spectra, or the number of ensembles, has a different meaning, explained as follows.

PEAK - This mode runs continuously by simply making a point by point comparison of the last averaged spectrum with the current real time spectrum. The greater point value of either becomes that point of the new averager output spectrum. The number of averager ensembles has no meaning in this mode.

LINEAR (LIN) - This mode runs until the selected number of ensembles have been averaged, at which time the averager STOP indicator will light. To perform another average, the RESET command (see below) must be sent to reset the averager. The method of averaging is to point by point take $1/n$ of the current real time spectrum, where n is the number of ensembles, and sum it over n real time spectra. The averager output is this sum.

EXPONENTIAL (EXPO/EXT) - This mode runs continuously by point by point taking $(n-1)/n$ of the last averaged spectrum and adding $1/n$ of the current real time spectrum, the sum of which is the averager output spectrum.

There are also three averager control commands: RESET, STOP, and START. These commands are accessible both from the GPD 350-6A front panel and over GPIB. They identically control the averager under any mode of processing control as follows.

RESET - Stops the Averager and loads all zeros into averager memory. Both the RESET and STOP indicators will be lit.

STOP - Stops the averager and lights the STOP indicator. The averager may be restarted with the START command. Old averager data will remain in the averager memory.

START - Starts the averager and lights the START indicator. In the LIN mode the averager must have been first RESET to START.

NOTES:

- Refer to Section 7.2 for averager update times.
- Switching from either PEAK or EXPO modes to LIN mode will force a STOP command.
- A special averager operating mode exists for LIN and PEAK averaging when the AUX MEMORY controls are set for AUTO LOAD TRANSFER with AVGR as the source. In this mode the averager will continuously: perform the average of the selected number of ensembles, transfer the results to auxiliary memory, and RESET and START the averager. The three commands RESET, STOP, and START have no effect in this mode.

4.1.4 Processing Control

The GPD 351A performs two major functions when present in a GPD 350-6A system configuration, that of a GPD 350-6A Range Extender, and that of a GPIB interface to both the GPD 350-6A and the GPD 351A. In performing both of these functions the question arises as to which device, the GPD 351A, the GPD 350-6A, or the external computer is in actual control of the system's processing parameters. The following is an overview of the determination of the GPD 350-6A/GPD 351A processing control status.

GPD 350-6A/GPD 351A Range Control

The GPD 351A's primary role is that of a GPD 350-6A Range Extender. As such, the GPD 351A must gain and relinquish control of the system range processing parameters, bandwidth, center frequency, and translation. The passage of control is determined by the following rules:

- The GPD 351A is enabled to gain control by setting the following GPD 350-6A front panel switches to the EXT position:

RANGE (Hz)
MAGNIFY
EXPAND Mode
%RANGE

These switches are termed the "control relative switches."

- The external computer determines which device, the GPD 351A or the GPD 350-6A, has control when the GPD 351A is enabled. This is done by using Command F0.
- The power up default is for the GPD 351A to gain control when enabled.
- The GPD 351A ENABLED LED will light when the GPD 351A is in enabled.
- The external computer may determine if the GPD 351A is enabled by performing a Serial Poll of the GPD 351A and testing Bit 4. See Section 6.0.
- The external computer may determine which device is in control by using Command B6.

- Any values written to the GPD 350-6A control relative switches while the GPD 351A is in control will be ignored.
- All GPD 350-6A switches other than the control relative switches function normally when the GPD 351A is in control.

GPD 350-6A Remote/Local Control

In addition to operating as a Range Extender, the GPD 351A also acts as a GPIB interface to the GPD 350-6A. This interface allows an external computer to both read the GPD 350-6A's local, or front panel, switch settings, and to remotely control the GPD 350-6A's switch settings. The remote/local interface of the GPD 350-6A is on a switch by switch basis, whereby a switch may be either read only, read/write, with settings only writable when the switch is manually set to the EXT position, or read/write at any time. Thus, the GPD 350-6A cannot be placed under an overall remote control state by an external computer. For a description of how each GPD 350-6A front panel switch appears over the GPIB Interface, see Section 4.1.1.

GPD 351A Remote/Local Control

Functioning as a range extender, the GPD 351A is also accessible by an external computer over the GPIB interface. Unlike the GPD 350-6A, however, the GPD 351A can operate in an overall remote or local control state. This means that the GPD 351A's processing parameters are either all controlled by the front panel, or all controlled by the external computer. The following notes apply to the passage of control.

- The GPD 351A may be placed into the remote control state only when it is in GPD 350-6A/GPD 351A processing control.
- The GPD 351A powers up in local control.
- Remote control is attained by the external computer raising the REN line and then addressing the GPD 351A as a listener. Thus, the GPD 351A will go to remote whenever it is addressed as a listener and the REN line is high.

- The GPD 351A may be placed in local control by any of the following means: lowering of the REN line by the external computer, sending of the GTL command by the external computer, or setting of the GPD 351A REMOTE ENABLE/LOCAL front panel switch to the LOCAL position.
- The return of the GPD 351A from remote to local control is related to the external computer by Bit 1 of the Serial Poll Byte.
- When placed into remote control the GPD 351A will continue to function with all processing parameters set to their last local values.
- All GPD 351A front panel switches are remotely controllable. They can be set to any of the available front panel values, except the RANGE (Hz) switch, which is expanded to 36 possible settings when remotely controlled.
- All GPD 350-6A non-control related switches function normally when the GPD 351A is in either remote or local control.

4.2 GPIB COMMANDS

4.2.1 Programming Procedure

The passage of programming information to and from a Controller and the GPD 351A is accomplished by a set of "Commands." Each Command informs the GPD 351A what operating information to send or receive. The command dependent operating information which is transferred after any Command is termed a Message Byte. Commands which request the GPD 351A to send information are termed Read Commands; Commands that request the GPD 351A to receive information are termed Write Commands. Both Commands and Message Bytes are transferred over the bus as GPIB data messages (see Section 3.2).

The procedure to request operating information from the GPD 351A is as follows:

- 1) Address the Controller as a Talker.
- 2) Address the GPD 351A as a Listener.
- 3) Transfer the Command for the desired information.
- 4) Address the Controller as a Listener.
- 5) Address the Controller as a Talker.
- 6) Read the requested number of Message Bytes defined for the Command sent.

The procedure to send operating information to the GPD 351A is as follows (see Section 4.1.4 for the specifications on the remote programmability of the GPD 351A and the GPD 350-6A):

- 1) Address the Controller as a Talker.
- 2) Address the GPD 351A as a Listener.
- 3) Transfer the Command for the desired programming information.
- 4) Transfer the appropriate number of Message Bytes as defined for the Command sent.

Sections 4.2 and 4.3 which follow relate the Message Byte coding for each of the GPD 351A Read and Write Commands. All Commands and Message Bytes are given in hexadecimal.

NOTE: The default Talk/Listen address identifier of the GPD 351A as shipped is 5. To alter this address, DIP switch S1 on the GPD 351A Rear Panel must be altered. The 8-position switch is formatted as a byte, Position 8 being the LSB, Position 1 the MSB. OPEN = 1, CLOSED = 0. To access the switch the clear plastic cover may be popped off with a screwdriver. Primary power of the GPD 351A must be cycled after any changes to the switch settings.

Table 4.2. Read/Write Commands Summary

Read Commands

Write Commands

GPD 3506A

C0 - RANGE (dB/Vrms)	E4 - AVERAGER CONTROL (AVGR)
C1 - POST-FILTER GAIN	E5 - EXPAND % RANGE
C2 - HOLD	E6 - AVERAGER METHOD
C3 - AVERAGER CONTROL (AVGR)	E7 - EXPAND (TOGGLE SWITCH)
C5 - EXPAND % RANGE	E8 - MAGNIFY
C6 - AVERAGER METHOD	E9 - AUX MEMORY SOURCE
C7 - EXPAND (TOGGLE SWITCH)	EA - AUX MEMORY TRANSFER
C8 - MAGNIFY	EB - NUMBER OF AVERAGES
C9 - AUX MEMORY SOURCE	EC - TRANSFORM SIZE
CA - AUX MEMORY TRANSFER	ED - RANGE (Hz) (BASE)
CB - NUMBER OF AVERAGES	EE - RANGE (Hz) (MULTIPLIER)
CC - TRANSFORM SIZE	EF - SPECTRUM DATA TRANSFER
CD - RANGE (Hz) (BASE)	
CE - RANGE (Hz) (MULTIPLIER)	
CF - SPECTRUM DATA TRANSFER	

GPD 351A

B0 - TRANSLATE	F0 - TRANSLATE
B1 - REMOTE EXTENDED RANGE	F1 - REMOTE EXTENDED RANGE
B4 - FRONT PANEL RANGE SWITCH	F5 - CENTER FREQUENCY
B5 - CENTER FREQUENCY	F7 - GAIN (dB), MISC
B7 - GAIN (dB), MISC	

Miscellaneous

B6 - 351A/350-6A CONTROL	F6 - 351A/350-6A CONTROL
B2 - SRQ MASK	F2 - SRQ MASK
B3 - 5 TEST BYTES	F3 - 5 TEST BYTES
B8 - CURSOR POSITION	

Name: RANGE (dB/1Vrms)

C0
(READ)

Hex Code: C0

Format: Selects the input gain from -40 dB to +40 dB in 10 dB steps.

<u>Code</u>	<u>Meaning of Value (dB)</u>
8	+40
7	+30
6	+20
5	+10
4	0
3	-10
2	-20
1	-30
0	-40

Name: POST-FILTER GAIN

C1
(READ)

Hex Code: C1

Format: Selects additional gain to be applied to the signal following the anti-aliasing filter.

<u>Code</u>	<u>Meaning of Value (dB)</u>
3	+30
2	+20
1	+10
0	0

Name: HOLD

C2
(READ)

Hex Code: C2

Format: Operates load control of Input Memory.

<u>Code</u>	<u>Meaning of Value</u>
1	"HOLD" on
0	"HOLD" off

Name: AVERAGER CONTROL (AVGR)

C3
(READ)

Hex Code: C3

Format: Averaging process status.

<u>Code</u>	<u>Meaning of Value</u>
4	START
3	RESET
2	STOP

Name: EXPAND % RANGE

C5
(READ)

Hex Code: C5

Format: Determines the center frequency of the intensified or translated portion of the GPD 350-6A bandwidth by taking a percentage of the RANGE (Hz) switch frequency.

<u>Code</u>	<u>Meaning of Value</u>
0	EXT
1-C7	.5 to 99.5 in .5% steps

Name: AVERAGER METHOD

C6
(READ)

Hex Code: C6

Format: Current averager processing method.

<u>Code</u>	<u>Meaning of Value</u>
2	Linear
1	Peak
0	Exponential/EXT

Name: EXPAND

C7
(READ)

Hex Code: C7

Format: Enable the GPD 350-6A's intensified display (INTEN) or translate (ON) modes.

<u>Code</u>	<u>Meaning of Value</u>
2	INTEN
1	ON
0	OFF/EXT

Name: MAGNIFY

C8
(READ)

Hex Code: C8

Format: Fraction of the GPD350-6's switch setting to be used as the bandwidth by the above EXPAND modes.

<u>Code</u>	<u>Meaning of Value</u>
7	x128
6	x64
5	x32
4	x16
3	x8
2	x4
1	x2
0	EXT

Name: AUX MEMORY SOURCE

C9
(READ)

Hex Code: C9

Format: Spectrum data type to be loaded into the GPD350-6A's AUX memory.

<u>Code</u>	<u>Meaning of Value</u>
2	Real Time
1	Average
0	EXT

Name: AUX MEMORY TRANSFER

CA
(READ)

Hex Code: CA

Format: Method of data transfer into the GPD 350-6A's AUX memory.

<u>Code</u>	<u>Meaning of Value</u>
2	LOAD (Single Spectrum)
1	AUTO LOAD (Continuous)
0	HOLD/EXT

Name: NUMBER OF AVERAGES CB
(READ)

Hex Code: CB

Format: Number of averager ensembles.

<u>Code</u>	<u>Meaning of Value</u>
A	512
9	256
8	128
7	64
6	32
5	16
4	8
3	4
2	2
1	1
0	EXT

Name: TRANSFORM SIZE CC
(READ)

Hex Code: CC

Format: FFT transform size.

<u>Code</u>	<u>Meaning of Value</u>
7	2048
6	1024
5	512
4	256
3	128
2	64
0	EXT

Name: RANGE (Hz) (BASE)

CD
(READ)

Hex Code: CD

Format: GPD 350-6A Base Range value to be multiplied by the RANGE MULTIPLIER (Code CE) to determine the actual processing range. Codes the front panel switch RANGE (Hz).

<u>Code</u>	<u>Meaning of Value</u>
2	250 Hz
1	10 Hz
0	10 KHz

Name: RANGE (Hz) (MULTIPLIER)

CE
(READ)

Hex Code: CE

Format: Multiplier to the GPD 350-6A Range Base (Code CD). Codes the front panel switch RANGE (Hz). As an example, the GPD 350-6A RANGE (Hz) setting of 200 KHz is read as a 0 by Command CD, and a 14 (hex) by Command CE ($200,000 = 14 * 10,000$).

<u>Code</u>	<u>Meaning of Value</u>
0	EXT
1-20	Range Code Multiplier 1-32

Name: SPECTRUM DATA TRANSFER **CF**
 (READ)

Hex Code: CF

Format: Spectrum data read from the GPD 350-6A.

<u>Code</u>	<u>Meaning of Value</u>
0	12-Bit Real Time or AUX data depending on the position of the GPD 351A DUAL DISPLAY switch (UP - AUX, DOWN - REAL TIME).
1	12-Bit Averager Data.
2	8-Bit Format of Code 0.
3	8-Bit Format of Code 1.

Name: TRANSLATE **B0**
 (READ)

Hex Code: B0

Format: GPD 351A Translate function.

<u>Code</u>	<u>Meaning of Value</u>
0	Translate Disabled
1	Translate Enabled

Name: REMOTE EXTENDED RANGE

B1
(READ)

Hex Code: B1

Format: Current GPD 351A Processing Range determined by multiplying the Base value by 2 raised to the power of the Code (lower nibble).

Bit 7 Not Used
Bit 6 1500 Hz Base
Bit 5 1000 Hz Base
Bit 4 600 Hz Base
Bit 3-0 (see table below)

Bit 3-0				
<u>Code</u>	<u>Value</u>	<u>1500 Hz Base</u>	<u>1000 Hz Base</u>	<u>600 Hz Base</u>
C		6.144 MHz	4.096 MHz	2.4576 MHz
B		3.072 MHz	2.048 MHz	1.2288 MHz
A		1.536 MHz	1.024 MHz	614,400 Hz
9		738,000 Hz	512,000 Hz	307,200 Hz
8		384,000 Hz	256,000 Hz	153,600 Hz
7		192,000 Hz	128,000 Hz	76,800 Hz
6		96,000 Hz	64,000 Hz	38,400 Hz
5		48,000 Hz	32,000 Hz	19,200 Hz
4		24,000 Hz	16,000 Hz	9,600 Hz
3		12,000 Hz	8,000 Hz	4,800 Hz
2		6,000 Hz	4,000 Hz	2,400 Hz
1		3,000 Hz	2,000 Hz	N/A
0		1,500 Hz	N/A	N/A

Name: SRQ MASK

B2
(READ)

Hex Code: B2

Format: Current Service Request Mask which determines the conditions under which an SRQ will be generated (Power-up default is 0). See Section 6.0.

Bit 7	Not Used
Bit 6	Not Used
Bit 5	Linear Average Complete
Bit 4	Front Panel Overwrite
Bit 3	Overload
Bit 2	Control Error
Bit 1	Return to Local
Bit 0	Not Used

Name: 5 TEST BYTES

B3
(READ)

Hex Code: B3

Format: Five test bytes previously received by Code F3. These bytes have no meaning other than to verify proper GPIB communications.

Name: FRONT PANEL RANGE SWITCH

B4
(READ)

Hex Code: B4

Format: Current GPD 351A front panel RANGE switch setting (see Code B1 for the current GPD 351A processing range).

<u>Code</u>	<u>Meaning of Value</u>
F	6.144 MHz
E	4.096 MHz
D	3.072 MHz
C	2.048 MHz
B	1.024 MHz
A	614.4 KHz
9	512 KHz
8	307.2 KHz
7	256 KHz
6	128 KHz
5	64 KHz
4	32 KHz
3	16 KHz
2	8 KHz
1	4 KHz
0	2 KHz

Name: CENTER FREQUENCY

B5
(READ)

Hex Code: B5

Format: Seven byte array containing the current GPD 351A Center Frequency, least significant digit to most significant.

<u>Order of Data Byte</u> <u>Sent From GPD 351A</u>	<u>Meaning of Value</u>
1	x 1
2	x 10
3	x 100
4	x 1000
5	x 10,000
6	x 100,000
7	x 1,000,000

Name: 351A/350-6A CONTROL

B6
(READ)

Hex Code: B6

Format: Determines whether the GPD 351A or the GPD 350-6A is in control.

<u>Code</u>	<u>Meaning of Value</u>
0	GPD 350-6A in Control
1	GPD 351A in Control

Name: GAIN (dB), MISC

B7
(READ)

Hex Code: B7

Format: Current GPD 351A Gain, Input Termination, and Test Select settings. Formatted as follows:

Bits 0 and 1, Gain (dB):

<u>Code</u>	<u>Meaning of Value</u>
00	0 dB
01	5 dB
10	10 dB
11	15 dB

Bit 2, Test Select:

<u>Code</u>	<u>Meaning of Value</u>
1	TEST
0	OPERATE

Bit 3, Input Termination:

<u>Code</u>	<u>Meaning of Value</u>
0	1K Ohms
1	50 Ohms

Name:

B8
(READ)

Hex Code: B8

Format: Current displayed cursor position. Formatted as 2 bytes, LSB first. Values range from 0 to the number of points per transform size (see Section 4.1.1). The value of 0 represents the cursor fully to the left of the display.

Name: AVERAGER CONTROL (AVGR)

E4
(WRITE)

Hex Code: E4

Format: GPD 350-6A averager processing control.

<u>Code</u>	<u>Meaning of Value</u>
3	RESET
2	STOP
1	START

Name: EXPAND % RANGE E5
(WRITE)

Hex Code: E5

Format: Determines the center frequency of the intensified or translated portion of the GPD 350-6A bandwidth by taking a percentage of the RANGE (Hz) switch frequency.

Writable only when the actual front panel switch is set to "00.0".

<u>Code</u>	<u>Meaning of Value</u>
0	GPD 350-6A switch is in external "EXT"
1-C7	.5 TO 99.5 in .5 steps

Name: AVERAGER METHOD E6
(WRITE)

Hex Code: E6

Format: GPD 350-6A averager processing method. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
2	Linear Average
1	Peak Average
0	Exponential average and "EXT"

Name: EXPAND (TOGGLE SWITCH)

E7
(WRITE)

Hex Code: E7

Format: Enable the GPD 350-6A's intensified display (INTEN) or translate (ON) modes. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
2	INTEN
1	ON
0	OFF/EXT

Name: MAGNIFY

E8
(WRITE)

Hex Code: E8

Format: Fraction of the GPD 350-6A's RANGE (Hz) switch setting to be used as the bandwidth by the above EXPAND modes. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
7	x128
6	x64
5	x32
4	x16
3	x8
2	x4
1	x2
0	EXT

Name: AUX MEMORY SOURCE **E9**
(WRITE)

Hex Code: E9

Format: Type of spectrum data to be placed in the GPD350-6A's AUX memory. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
2	Real Time
1	Average
0	EXT

Name: AUX MEMORY TRANSFER **EA**
(WRITE)

Hex Code: EA

Format: Method of data transfer to AUX memory. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
2	LOAD (Single Spectrum)
1	AUTO LOAD (Continuous)
0	HOLD/EXT

Name: NUMBER OF AVERAGES

EB
(WRITE)

Hex Code: EB

Format: Number of averager ensembles. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
A	512
9	256
8	128
7	64
6	32
5	16
4	8
3	4
2	2
1	1
0	EXT

Name: TRANSFORM SIZE

EC
(WRITE)

Hex Code: EC

Format: FFT transform size. Writable only when the front panel switch is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
7	2048
6	1024
5	512
4	256
3	128
2	64
0	EXT

Name: RANGE (Hz) (Base) **ED**
(WRITE)

Hex Code: ED

Format: GPD 350-6A Base Range to be multiplied by the Range Multiplier (Code EE) to determine the actual processing range. Writable only when the front panel switch RANGE (Hz) is set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
2	250 Hz
1	10 Hz
0	10 KHz

Name: RANGE (Hz) (Multiplier) **EE**
(WRITE)

Hex Code: EE

Format: Multiplier to the GPD 350-6A Range Base (Code EC). Writable only when the front panel switch RANGE (Hz) is set to EXT.

Name: SPECTRUM DATA TRANSFER **EF**
(WRITE)

Hex Code: EF

Format: Spectrum data write to the GPD 350-6A's AUX memory. Both the AUX MEMORY SOURCE and the AUX MEMORY TRANSFER switches must be set to EXT.

<u>Code</u>	<u>Meaning of Value</u>
0	12-Bit Data
2	8-Bit Data

Name: TRANSLATE

F0
(WRITE)

Hex Code: F0

Format: Enables the GPD 351A Translate function.

<u>Code</u>	<u>Meaning of Value</u>
0	Translate Disable
1	Translate Enable

Name: REMOTE EXTENDED RANGE

F1
(WRITE)

Hex Code: F1

Format: GPD 351A processing range. The GPD 351A must be in the remote mode to issue this command.

Bit 7	Not Used
Bit 6	1500 Hz Base
Bit 5	1000 Hz Base
Bit 4	600 Hz Base
Bit 3-0	(see table below)

<u>Code</u>	<u>Value</u>	<u>1500 Hz Base</u>	<u>1000 Hz Base</u>	<u>600 Hz Base</u>
C		6.144 MHz	4.096 MHz	2.4576 MHz
B		3.072 MHz	2.048 MHz	1.2288 MHz
A		1.536 MHz	1.024 MHz	614,400 MHz
9		768,000 Hz	512,000 Hz	307,200 Hz
8		384,000 Hz	256,000 Hz	153,600 Hz
7		192,000 Hz	128,000 Hz	76,800 Hz
6		96,000 Hz	64,000 Hz	38,400 Hz
5		48,000 Hz	32,000 Hz	19,200 Hz
4		24,000 Hz	16,000 Hz	9,600 Hz
3		12,000 Hz	8,000 Hz	4,800 Hz
2		6,000 Hz	4,000 Hz	2,400 Hz
1		3,000 Hz	2,000 Hz	N/A
0		1,500 Hz	N/A	N/A

Name: SRQ MASK

F2
(WRITE)

Hex Code: F2

Format: Service Request mask which determines the conditions under which an SRQ will be generated by the GPD 351A. See Section 6.0.

Bit 7	Not Used
Bit 6	Not Used
Bit 5	Linear Average Complete
Bit 4	Front Panel Overwrite
Bit 3	Overload
Bit 2	Control Error
Bit 1	Return to Local
Bit 0	Not Used

Name: 5 TEST BYTES

F3
(WRITE)

Hex Code: F3

Format: Five test bytes which are to be read back by Code B3 to verify GPIB communication. These bytes have no other function.

Name: CENTER FREQUENCY

F5
(WRITE)

Hex Code: F5

Format: Seven-byte GPD 351A Center Frequency array, least significant digit to most significant. The GPD 351A must be in the remote mode to issue this command.

<u>Order of Data Bytes</u> <u>Sent From the Controller</u>		<u>Meaning of Value</u>
	1	x 1
	2	x 10
	3	x 100
	4	x 1000
	5	x 10,000
	6	x 100,000
	7	x 1,000,000

Name: 351A/350-6A CONTROL

F6
(WRITE)

Hex Code: F6

Format: Determines whether the GPD 351A or the GPD 350-6A is in control.

<u>Code</u>	<u>Meaning of Value</u>
0	GPD 350-6A in control.
1	GPD 351A in control.

Name: GAIN (dB), MISC

F7
(WRITE)

Hex Code: F7

Format: Controls the current GPD 351A Gain, Input Termination, and Test Select settings. Formatted as follows.

Bits 0 and 1, Gain (db):

<u>Code</u>	<u>Meaning of Value</u>
00	0 dB
01	5 dB
10	10 dB
11	15 dB

Bit 2, Test Select:

<u>Code</u>	<u>Meaning of Value</u>
1	TEST
0	OPERATE

Bit 3, Input Termination:

<u>Code</u>	<u>Meaning of Value</u>
0	1K Ohms
1	50 Ohms

5.0 DATA FORMATS

The GPD 351A supplies the controller the capability to both read and write GPD 351A and GPD 350-6A data in two formats, a full dynamic range 12-bit format and a faster, yet reduced range, 8-bit format. The following notes apply to the transfer of both formats:

- Data may be read from three sources: the Real Time processor, the Averager, and from AUX Memory. Averager data is available at all times. The choice of Real Time or AUX Memory data as a source is dependent on the position of the GPD 350-6A front panel DUAL DISPLAY LOWER/UPPER trace select switch. LOWER = AUX Memory data, UPPER = Real Time data.
- Data written to the GPD 351A is actually written to the GPD 350-6A AUX Memory. To facilitate the transfer the GPD 350-6A AUX MEMORY TRANSFER and AUX MEMORY SOURCE switches must be set to the EXT position.
- The only distinction made as to whether the data is being processed by the GPD 351A or the GPD 350-6A is a difference in an offset factor used in the conversion of data to decibels. The device in control is the default data source.
- Data may be transferred in any Remote/Local state and will not interrupt either system's processing status.
- Data transferred represents the magnitude squared value of the actual complex data point.

5.1 12-Bit Data

The 12-bit data format is in two bytes transferred for each displayed data point, least significant byte first. The total number of bytes transferred is therefore dependent on the current Transform Size and is given by the following formula:

$$\text{Total 12 Bit Bytes} = 50 \times [2^{**} (T - 2)]$$

where T is the code returned by a read of the GPD 350-6A Transform Size by Command CC. (Here, ** represents expotentialiation.)

To convert the magnitude squared data values to dB, use the following formula:

$$\text{dB} = .047036 * [(\text{LSB} - 64) + 64 * (\text{MSB} - 64)] \\ - \text{Offset} - (\text{Gain})$$

The subtraction of 64 from each byte is done here to strip the 01 code of the upper two bits. This code is appended to allow the transfer of data to be compatible with those systems that transfer only printable ASCII characters.

The term Offset is an offset correction factor relative to the processor's full scale output. The value of offset is device dependent as follows:

GPD 350-6A DATA	
Amplitude Range:	- 179.2 dB to 12.7 dB
Offset:	179.8 dB
GPD 351A DATA	
Amplitude Range:	- 199.2 dB to -7.3 dB
Offset:	199.2 dB

The term Gain is the gain applied by the device that is currently in control. Thus, if the GPD 350-6A is in control, Gain is the sum, in dB, of the front panel POST FILTER GAIN setting and the RANGE (dB) setting, if the GPD 351A is in control, Gain is the current setting of the GAIN (dB) switch.

5.2 8-Bit Data

The 8-bit data format is a reduced range version of the 12-bit format. Each byte transferred directly represents a displayed data point. The total number of bytes transferred is given by the following formula:

$$\text{Total 8 Bit Bytes} = 25 * [2 ** (T - 2)]$$

where T is again the Transform Size code as returned by Command CC.

To convert the 8-bit magnitude squared data to dB, use the following formula:

$$\text{dB} = .28055 * (8 \text{ Bit Data}) - \text{Offset} - \text{Gain}$$

As in the conversion of 12-bit data, the term Offset represents a correction factor relative to the processor's full scale output.

GPD 350-6A DATA	
Amplitude Range:	- 67.6 dB to 4.0 dB
Offset:	67.6 dB

GPD 351A DATA

Amplitude Range: - 87.6 dB to - 16.0 dB
Offset: 87.6 dB

In addition, the term Gain represents the gain in dB as applied by the device currently in control.

NOTE: The 8-bit format is not compatible with those controllers that transfer only printable ASCII characters.

6.0 SERIAL POLL STATUS BYTE

The Serial Poll Status Byte is a means by which the controller can quickly determine the operational status of each device on the bus. Included in the Serial Poll Byte is the dedicated Service Request (SRQ) bit which is used by any device that may need to request the service of the controller. The setting of this bit by a device will also raise the SRQ bus line, flagging the controller that someone on the bus is in need of service. In response to the SRQ, the controller sequentially performs a Serial Poll of each device to determine which device is the one in need of service.

The following defines the GPD 351A's implementation of the Serial Poll byte. Each bit of the Serial Poll byte functions as a GPD 350-6A/GPD 351A processing status flag.

In addition to the Serial Poll byte, the GPD 351A supplies the controller access to a Service Request Mask. This mask mirrors the Serial Poll byte's bit by bit definition, but is used to set which GPD 351A status condition will generate an SRQ. Thus, if the Service Request Mask was set to 01 hex, the GPD 351A will generate an SRQ if and only if the condition assigned to Bit 0 is true. See Commands B2 and F2 for the reading and writing of the Service Request Mask.

SERIAL POLL BYTE =====

BIT 7 Not used.

BIT 6 SRQ: Set if any of the condition bits in the Service Request Mask is set (unmasked) and at least one of the corresponding conditions of the Serial Poll byte is true. Reset by the Serial Poll if all the unmasked conditions are now false, or if all the SRQ generating conditions become masked.

- BIT 5 Linear Average Complete: Set by a GPD 350-6A averager STOP while in the Linear averaging mode. Cleared by an averager RESET, or by the Serial Poll if this Service Request Mast bit is set. (See Section 4.1.3.)
- BIT 4 Front Panel Overwrite: Set low if all the GPD 350-6A control relative switches (RANGE (Hz), MAGNITUDE, %RANGE, and EXPAND Mode are in the EXT position, high otherwise. Will remain high until a Serial Poll if any of the control relative switches has been deselected from EXT and this bit in the Service Request Mask is set. (See Section 4.1.4.)
- BIT 3 Overload: Set upon overload as indicated by the GPD 351A front panel overload LED, cleared otherwise. If this bit is also set in the Service Request Mask, a Serial Poll must be done to clear this Serial Poll Status bit.
- BIT 2 Control Error: Set if the GPD 351A receives an illegal GPIB command or an illegal GPD 351A or GPD 350-6A switch Write Code. Also set if an illegal GPD 351A Center Frequency is selected on the front panel. Reset by the Serial Poll if this bit is set in the Service Request Mask. If an illegal switch Write Code was the bit setting condition, a legal Code must be written to the switch in question, prior to the Serial Poll, for this bit to be Reset.
- BIT 1 Return to Local: Set if the LOCAL position of the GPD 351A front panel REMOTE/LOCAL switch has been selected. Reset by the Serial Poll if this mask bit is set in the Service Request Mask.
- BIT 0 Not Used.

7.0 PROGRAMMING NOTES

7.1 Communications Timing

A crucial factor in the error-free programming of a device over the GPIB is the realization by the controller of any device dependent timing limitations. These limits encompass such timing factors as command response time, system state change time, data transfer time, and general data processing time. Depending on the speed of execution of the application software, the effects of these limits on the correct programming of a device can vary greatly from controller to controller.

In general, the most realistic approach for a controller to take in determining whether any device timing limitations may affect the control of a device is to run a few sample timing tests. In this way, the controller can derive any needed software wait loop constants prior to debugging the typically more complicated applications software.

The following list represents the GPD 350 6A/GPD 351A system control functions which may have an associated processing delay as seen over the GPIB:

REMOTE/LOCAL Transitions: Time needed in the change of GPD 351A operating control from LOCAL to REMOTE, or vice versa.

Passage of Control: Time needed to pass processing control from the GPD 350-6A to the GPD 351A, or vice versa.

Averager Control: Time needed by the GPD 350-6A Averager to change processing state.

Write Command Response: Time needed for the GPD 351A to process a switch Write Command, plus the time needed by hardware, either the GPD 351A or the GPD 350-6A, to implement the switch write.

7.2 Data Transfer Timing

Given the ability to both read and write GPD 350-6A/GPD 351A spectrum data over the GPIB two questions arise, when is data available for transfer, and how long does the actual transfer take.

The latter question is easily answered by stating that the maximum data transfer rate of the GPD 351Aas dictated by DMA hardware is 12.5 micro-seconds per byte. The actual transfer rate per spectrum, however, is dependent on the maximum rate obtainable by the controller. As an example of the order of magnitude that can be expected, an IBM XT transfers an 800-point spectrum in approximately 54 ms, while an HP-85 transfers the same 800-point spectrum in 167 ms.

The question of when data is available for transfer is rather more complicated to answer in that it is related to the validity of the data transferred. While it is true that the maximum FFT processing time of an 800 pt spectrum is 14 ms, it is not true that each output spectrum represents fully processed input data.

To determine when input data has been fully processed, the term Memory Period has been defined. Simply stated, the time taken by the FFT to transform a completely new set of input time domain data to the output frequency domain is given by: (Memory Period / 2). The Memory Period of the FFT is dependent on two processing parameters, the bandwidth in Hz, and the number of transform points. Thus, the time in which a spectrum of completely new input data is output by the FFT is given by:

$$\text{(Memory Period / 2)} = \frac{\text{(Number of Points per Transform)}}{2 * \text{(Processing Bandwidth (Hz))}}$$

In addition to the timing factor Memory Period, the FFT also has an associated cycle time. The FFT Cycle Time is the time taken by the FFT to output each individual spectrum. (To demonstrate the difference between FFT Cycle Time and Memory Period, set the GPD 350-6A in control, set the input to TEST, and switch between RANGE (Hz) values less than 200 Hz; the display will continuously update (FFT Cycle Time), but the true TEST spectrum will only be evident after (Memory Period / 2) seconds).

In the instance that the processing bandwidth is large enough such that the (Memory Period / 2) is less than the FFT Cycle Time, the FFT Cycle Time is the time in which input data has been fully processed. The following table lists the FFT Cycle Time per GPD 350-6A Transform Size.

<u>Transform Size</u>	<u>Number of Points</u>	<u>FFT Cycle Time</u>
64	25	.3 ms
128	50	.6 ms
256	100	1.4 ms
512	200	3.0 ms
1024	400	6.5 ms
2048	800	14.0 ms

Thus, the time (in seconds) in which a spectrum of completely new input data is available for transfer is given by:

Real Time Data (Sweep 1):

Greater of [(Memory Period / 2) or FFT Cycle Time]

Averager Data (Sweep 2):

Number of Averages * (Greater of [(Memory Period / 2)
or FFT Cycle Time])

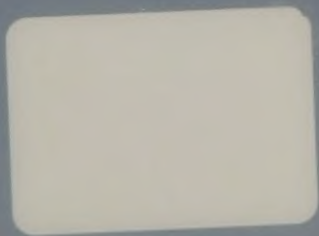
7.3 Data Transfer Interface

Included in the GPIB specifications is the data transfer termination signal EOI (end or identify). The EOI signal line is used by a talker to indicate to the controller that the current data byte being transferred is the last.

The GPD 351A as a talker has the selectable ability to send an EOI with the last byte of any multiple byte transfer. Since the total number of bytes transferred for any GPD 351A GPIB communication is always known, this feature is only included for those controllers which require it.

To enable the EOI feature, set Position 3 of Dip Switch S2 on the GPD 351A CPU card, Slot All, to the CLOSED position. EOI disabled, or the OPEN selection of this switch, is the factory default.





MP MASTER



MA29826